

EDUCATIONAL PLAN

Valid from the academic year 2022-2023

Faculty:	Physics
The cycle of university studies:	Master
Name of the master's degree program:	Fizica si tehnologia materialelor avansate/ Physics and Technology of Advanced Materials
Name of the qualification acquired after graduating from the study program:	Specialist in material physics
Title awarded:	Master in Physics
Duration of studies (in years):	2 years
Number of credits (ECTS):	120
Form of education:	Full-time education
Language of instruction:	English
Geographical location of studies:	Timișoara
The framing of the study program in science fields	
Fundamental field:	Mathematicw and natural sciences
Science Branch:	Physics
The field of university master's studies:	Physics
Name of the broad field of study (according to DL-ISCED F-2013):	Natural sciences, mathematics and statistics
Name of the restricted field of studies (according to DR-ISCED F-2013):	Physical sciences
Name of the detailed field of study (according to DDS-ISCED F-2013):	Physics

GENERAL PRESENTATION OF THE PROGRAM OF UNIVERSITY STUDIES

1. The mission of the study program ¹

The mission of the master's studies in "**Physics and Technology of Advanced Materials**" is to prepare qualified personnel for higher education and researchers in a field - closely related to condensed matter physics and materials science and technology. Thanks to the experimental and theoretical skills acquired during the study, students will also have the ability to respond to the needs of the industrial community in areas such as materials technology, automotive industry, chemical engineering, IT and others.

Within this master's specialization, a basic training is provided in the field of theoretical and experimental physics, the physics of crystallization processes, nanosystems, physical methods for characterizing materials, transport phenomena, technologies for obtaining advanced materials, and numerical modeling and simulation methods. Also, special attention is paid to current trends in scientific research and demand both nationally and internationally, such as obtaining new materials with improved properties, relaxation processes, nanosystems in electromagnetic fields, obtaining crystals with laser potential, control of the flow of a melt with the help of magnetic and electric fields.

¹ *Misiunea și obiectivele programului de studii trebuie să fie în concordanță cu misiunea Universității de Vest din Timișoara și cu cerințele identificate pe piața muncii.*

Conform *Cartei universitare* (articolul 5), **misiunea generală a UVT este de cercetare științifică avansată și educație, generând și transferând cunoaștere către societate** prin:

a) cercetare științifică, dezvoltare, inovare și transfer tehnologic, prin creație individuală și colectivă, în domeniul științelor, al științelor ingineresti, al literelor, al artelor, prin asigurarea performanțelor și dezvoltării fizice și sportive, precum și valorificarea și diseminarea rezultatelor acestora;

b) formare inițială și continuă, la nivel universitar, în scopul dezvoltării personale, a inserției profesionale a individului și a satisfacerii nevoilor de competențe ale mediului socio-economic.

UVT își asumă misiunea proprie de catalizator al dezvoltării societății românești prin crearea unui mediu inovativ și participativ de cercetare științifică, de învățare, de creație cultural-artistică și de performanță sportivă, transferând spre comunitate competențe și cunoștințe prin serviciile de educație, cercetare și de consultanță pe care le oferă partenerilor din mediul economic și socio-cultural.

Realizarea misiunii UVT se concretizează în (*articolul 6 din Carta UVT*):

- promovarea cercetării științifice, a creației literar-artistice și a performanței sportive;
- formarea inițială și continuă a resurselor umane calificate și înalt calificate;
- dezvoltarea gândirii critice și a potențialului creativ al membrilor comunității universitare;
- crearea, tezurizarea și răspândirea valorilor culturii și civilizației umane;
- promovarea interferențelor multiculturale, plurilingvistice și interconfesionale;
- afirmarea culturii și științei românești în circuitul mondial de valori;
- dezvoltarea societății românești în cadrul unui stat de drept, liber și democrat.

2. Competencies and expected learning outcomes formed within the study program

A. COMPETENCIES²

Key-Competences³:

- Creative application of research and problem solving techniques;
- Elaboration of studies and reports that can be published or applied professionally;
- The ability to lead working groups and to communicate in the most diverse contexts;
- The ability to act independently and creatively in approaching and solving problems, to objectively and constructively evaluate critical situations, to creatively solve problems and to communicate demonstratively;
- Leadership skills and clear engagement on the path of own professional development.
- Personal, social and learning skills
- Civic skills
- Entrepreneurial skills
- Awareness and expression skills

Professional Competencies⁴:

- The ability to develop new materials with well-defined properties;
- The ability to characterize the specific properties of some materials taking into account the field in which they are used;
- Skills in using the necessary equipment to obtain monocrystalline materials and nano-microsystems;
- The ability to use experimental techniques to obtain and characterize materials through optical and spectroscopic methods;
- Use of materials structure investigation methods;
- Use of the computer and calculation programs for the numerical simulation of physical processes specific to obtaining materials;
- Acquisition of a coherent and functional system of fundamental knowledge in the field of materials science;
- Optimizing crystal growth facilities by using numerical modeling;
- Testing the experimental data with the results of different theoretical models.

² *Competența (competence)* reprezintă capacitatea dovedită de a selecta, combina și utiliza adecvat cunoștințe, aptitudini și abilități personale, sociale și/sau metodologice și alte achiziții constând în valori și atitudini, pentru rezolvarea cu succes a unei anumite categorii de situații de muncă sau de învățare, precum și pentru dezvoltarea profesională ori personală în condiții de eficacitate și eficiență.

³ *Competențele-cheie pentru învățarea pe tot parcursul vieții* sunt acele competențe de care au nevoie toți cetățenii pentru împlinirea și dezvoltarea personală, ocuparea unui loc de muncă, incluziune socială și cetățenie activă, fiind dezvoltate în perspectiva învățării pe tot parcursul vieții, începând din copilăria mică și pe tot parcursul vieții adulte, prin intermediul învățării formale, non-formale și informale.

⁴ *Competențele profesionale* reprezintă capacitatea de a realiza activitățile cerute la locul de muncă la nivelul calitativ specificat în standardul ocupațional. Acestea se dobândesc pe cale formală, respectiv prin parcurgerea unui program organizat de o instituție acreditată.

- The interdisciplinary approach of some topics in the field of physics

Transversal Competencies⁵:

a) Personal Competencies:

Of reflexivity:

- Engagement in effort
- Taking responsibility
- Autonomy in solving tasks
- The ability to filter information and establish its veracity
- Active learning capacity
- Ability to meet deadlines
- Ability to analyze, synthesize and make decisions responsibly
- The ability to self-motivate
- Ability to manage emotions/emotional intelligence
- Creativity
- Curiosity
- Flexibility and adaptability
- Critical and innovative thinking
- Risk management
- Stress management
- Time management
- Individual organization
- Perseverance
- Persuasion
- Complex information processing

Of entrepreneurship:

- Carrying out professional tasks efficiently and responsibly in compliance with field-specific deontology legislation under qualified assistance.
- Application of effective multidisciplinary team work techniques on various hierarchical levels.
- Effective use of information sources and communication resources and assisted professional training, both in Romanian and in an international language.
- Ethics and integrity
- Orientation towards objectives/results
- Strategic planning
- Solving complex problems
- Initiative spirit

b) Interpersonal skills:

Collaboration:

- Active listening
- Negotiation skills
- Empathy and assertive communication

⁵ *Competențele transversale* reprezintă achizițiile valorice și atitudinale care depășesc un anumit domeniu/program de studii și se exprimă prin următorii descriptori: responsabilitate și autonomie, interacțiune socială, dezvoltare personală și profesională.

- Leadership
- Teamwork
- Conflict management
- Team management

Of involvement:

- Orientation to the needs of the community

Of entrepreneurship:

- Ability to speak in public

c) Global citizenship skills:

Of reflexivity:

- Capacity for ethnic and intercultural understanding
- Critical thinking on the functioning of democratic society
- Concern for protecting the environment
- Solidarity
- Tolerance and respect for diversity

Of entrepreneurship:

- Respect for national values and laws, but also for European/international ones.

EXPECTED LEARNING OUTCOMES ⁶

a) Knowledge - According to the European Qualifications Framework (EQF), the learning outcomes related to qualification level 7, corresponding to university master's studies, require highly specialized knowledge and their critical awareness, some of them being at the vanguard of the level of knowledge from a field of work or study, as a basis for original thinking and/or research:

- to know the advanced notions in the field of Materials Physics, which involves a critical understanding of theories and principles;
- to know the methods of analysis and the criteria for choosing the appropriate solutions to achieve specific performances;
- to know the working formulas for calculations with physical quantities using properly the principles and laws of physics;
- to know the language specific to the field;
- to know physical phenomena and interpret them by formulating hypotheses and operationalizing key concepts and the appropriate use of laboratory equipment;

⁶ *Rezultatele învățării (learning outcomes)* înseamnă enunțuri care se referă la ceea ce cunoaște, înțelege și este capabil să facă un cursant la terminarea unui proces de învățare și care sunt definite sub formă de cunoștințe, abilități, responsabilitate și autonomie.

- to know the constructive and operating principles of the equipment for obtaining and characterizing materials and to explain how to use it;
- to know the basic concepts from related fields (chemistry, biology, biochemistry, informatics) in order to use them appropriately in complex teams;

b) Skills - According to the European Qualifications Framework (EQF), the learning outcomes related to qualification level 7, corresponding to university master's studies, assume specialized skills for solving research and/or innovation problems, for the development of new knowledge and procedures and for the integration of knowledge from different fields:

- correctly apply the methods of analysis and the criteria for choosing the appropriate solutions to achieve specific performances;
- deduce working formulas for calculations with physical quantities using the principles and laws of physics appropriately;
- to compare the theoretical results provided by the specialized literature with those of an experiment carried out within a professional project;
- to deduce the working formulas for calculations with physical quantities, using appropriately the principles and laws of physics;
- describe physical systems using specific theories and tools (experimental and theoretical models, algorithms, schemes, etc.);
- to apply the principles and laws of physics in solving theoretical or practical problems, under conditions of qualified assistance;
- correctly apply the analysis methods and the criteria for choosing the appropriate solutions to achieve the specified performances;
- to use the computer and calculation programs for the numerical simulation of the physical processes specific to obtaining the materials;
- use numerical modeling to optimize crystal growth facilities
- to use the computer to control some experiments or processes and to acquire data;
- to compare the results given by numerical models or simulations of physical phenomena with data provided by literature and/or experimental measurements;
- to identify the most appropriate methods to develop new materials with well-defined properties;
- to characterize the specific properties of some materials taking into account the field in which they are used;
- to use the necessary equipment to obtain monocrystalline materials and nano-microsystems;
- to use experimental techniques for obtaining and characterizing materials through optical and spectroscopic methods;
- to use methods of investigating the structure of materials;
- to acquire a coherent and functional system of fundamental knowledge in the field of science
- to elaborate and present reports on the physical principles of operation of some modern devices used in obtaining materials and their characterization (by spectroscopic, X-ray or microscopic methods) in front of an informed public;

- to write and present scientific reports in the field of Materials Physics.
- to make connections between knowledge in the field of material physics and related fields (chemistry, biology, informatics) in order to obtain new materials useful for various applications;
- c) Responsibility and autonomy** - According to the European Qualifications Framework (EQF), the learning outcomes related to qualification level 7, corresponding to university master's studies, involve the management and transformation of work or study situations that are complex, unpredictable and require new strategic approaches, by taking responsibility to contribute to professional knowledge and practices and/or to review the strategic performance of teams:
- to manage complex technical or professional activities or projects, by assuming responsibility for decision-making in impreved study situations

3. Occupations that can be practiced on the labor market

2111 Physicists and astronomers

Physicists and astronomers conduct research and improve or develop concepts, theories and operational methods relating to matter, space, time, energy, forces and fields and the interactions that occur within these physical phenomena. They apply scientific knowledge related to physics and astronomy in fields such as industry, medicine and the military (or other fields).

211101 physicist

211102 physics researcher

211103 research assistant in physics

211104 researcher in physics-chemistry

211105 research assistant in physics-chemistry

211106 researcher in technological physics

211107 research assistant in technological physics

4. Ensuring flexible learning paths within the study program

Flexibilizarea programului de studii este asigurată prin discipline opționale, discipline facultative și discipline complementare.

Disciplinele la alegere (opționale) sunt propuse pentru semestrele 1 și 3 și sunt grupate în **pachete opționale**, care completează traseul de specializare a studentului. Alegerea traseului se face de către student, înainte de începerea fiecărui an universitar.

Disciplinele facultative sunt propuse pentru semestrele 1-4 de către Departamentul Fizica sau Facultatea de Fizica, care gestionează programul de studii, dar pot fi alese și din pachetele oferite de alte facultăți ale UVT.

În conformitate cu prevederile *Regulamentului privind elaborarea planurilor de învățământ pentru programele de studii de la Universitatea de Vest din Timișoara*, pentru ca

studentii să poată beneficia de **credite pentru activități de voluntariat** în baza prevederilor Legii Educației Naționale nr. 1/2011, cu modificările și completările ulterioare (articolul 203, alineatul (9)), disciplina Voluntariat este disponibilă în fiecare semestru în planurile de învățământ ale tuturor programelor de studii universitare de licență și de masterat, cu statut de disciplină facultativă, cu un număr de 2 credite ECTS.

The flexibility of the study program is ensured through optional subjects, optional subjects and complementary subjects.

The disciplines of choice (optional) are proposed for semesters 1 and 3 and are grouped into optional packages, which complete the student's specialization path. The choice of the route is made by the student, before the start of each academic year.

The noncompulsory disciplines are proposed for semesters 1-4 by the Department of Physics or the Faculty of Physics, which manages the study program, but they can also be chosen from the packages offered by other faculties of UVT.

In accordance with the provisions of the Regulation on the development of education plans for the study programs at the University of West Timișoara, so that students can benefit from credits for volunteering activities based on the provisions of the National Education Law no. 1/2011, with subsequent amendments and additions (article 203, paragraph (9)), the Volunteering discipline is available every semester in the curricula of all bachelor's and master's degree programs, with optional subject status, with a number of 2 ECTS credits.

5. Professional activity and student assessment

The rights, obligations and conditions of the professional activity of students at the West University of Timișoara are regulated by the Code of Student Rights and Obligations and the Regulation on the professional activity of students from the bachelor's and master's study cycles of WUT, approved by the WUT Senate.

The form and assessment/examination methods for each subject in the curriculum are established by the subject sheets.

6. Final studies exam

In accordance with the Regulation on the organization and conduct of the final exams for bachelor's and master's university studies at the West University of Timișoara, approved by the WUT Senate, the final exam for master's university studies in any master's university study program organized at WUT it consists of a sample of elaboration and support of the dissertation work, for which 10 credits are awarded.

The topic and the bibliography corresponding to the final exam tests are published on each faculty's own website and/or on the WUT website before the beginning of each academic year.

Enrollment in the graduation exam is conditional on the student choosing the theme of the graduation thesis within 60 days at most from the beginning of the academic year of the final year of study.

The submission of the final version of the thesis on the e-learning platform is done at least 5 working days before the date scheduled for the start of the exam.

Each thesis will be accompanied, at the time of submission, by the Similarity Report resulting from the verification of the originality of the thesis through a specialized software, on the WUT e-learning platform.

According to the structure of the academic year, at WUT the exams for completing university studies can be organized in 3 sessions, usually in the months of July, September and February.

7. Preparation for the teaching profession (if applicable)

Students who wish to opt for a teaching career in pre-university education must complete (in addition to this study program) and complete the Psychopedagogical Training Program in order to certify the skills for the teaching profession and obtain the Certificate of Completion of this program. In the West University of Timișoara, this program is organized through the Department for the Training of Teaching Staff (DPPD) and can be followed in parallel with university studies or as a postgraduate. For more information, visit the link: <https://dppd.uvt.ro>.

LIST OF DISCIPLINES STUDIED, GROUPED BY YEARS AND SEMESTER OF STUDY

Study year I

Academic year 2022-2023

Nr. crt.	Discipline	C1	C2	Discipline Code	Semester I				Semester II					
					Number of hours/ week				Number of credits	Number of hours/ week				Number of credits
					C	S	L	P		C	S	L	P	
1.	Complements of Theoretical Physics	DF	DO	PTAM 1101	2	2	-	-	7	-	-	-	-	-
2.	Complements of Solid State Physics	DF	DO	PTAM 1102	2	2	-	-	7	-	-	-	-	-
3.	Complements of Atom and Molecule Physics	DF	DO	PTAM 1103	2	2	-	-	7	-	-	-	-	-
4.	Magnetic active materials	DS	DOP	PTAM 1104	2	2	-	-	7	-	-	-	-	-
	Symmetries in physics													
	Complements of biophysics with applications in medicine													
5.	Ethics of the research. Methodology of scientific work	DC	DO	PTAM 1105	1	1	-	-	2	-	-	-	-	-
6.	X-ray characterization of materials	DS	DO	PTAM 1201	-	-	-	-	-	2	2	-	-	7
7.	Crystal growth methods	DS	DO	PTAM 1202	-	-	-	-	-	2	1	-	-	6
8.	Microwaves and applications in materials science	DS	DO	PTAM 1203	-	-	-	-	-	2	-	2	-	5
9.	Nano particle systems in electromagnetic fields	DS	DO	PTAM 1204	-	-	-	-	-	2	-	1	-	5
10.	Transport phenomena	DS	DO	PTAM 1205	-	-	-	-	-	2	-	2	-	7
Total					9	9	-	=		10	3	5	-	
Total teaching hours per week					18				30	18				30

Noncompulsory Disciplines

Nr. crt.	Disciplina	C1	C2	Discipline Code	Semester I				Semester II					
					Number of hours/ week				Number of credits	Number of hours/ week				Number of credits
					C	S	L	P		C	S	L	P	
1.	Volunteering activity 1	DC	DFAC		-	1	-	-	2	-	-	-	-	-
2.	Volunteering activity 2	DC	DFAC		-	-	-	-	-	-	1	-	-	2

Legend

C1	content criterion
C2	the obligation criterion
DF	fundamental disciplines
DD	field disciplines (where applicable)
DS	specialized disciplines
DC	complementary disciplines
DO	compulsory (imposed) disciplines
DOP	optional disciplines (of your choice)
DFAC	Noncompulsory disciplines
CP	professional competency
CT	transversal competence
C	course-type didactic activity
S	seminar-type didactic activity
L	didactic activity of practical laboratory type
P	didactic activity of the internship type

Discipline code: <faculty><department><no. discipline>

Study year II

Academic year 2023-2024

Nr. crt.	Discipline	C1	C2	Discipline Code	Semester I				Semester II					
					Number of hours/ weekv				Number of credits	Number of hours/ week				Number of credits
					C	S	L	P		C	S	L	P	
1.	Magnetism of nanosystems	DS	DO	PTAM 2301	2		2		6	-	-	-	-	-
2.	Condensed Matter Spectroscopy	DS	DO	PTAM 2302	2	1	-		6	-	-	-	-	-
3.	Rheological characterization of materials	DS	DOP	PTAM 2303	2	1	-		6	-	-	-	-	-
	Physics of crystallization processes													
4.	Defects in crystals	DS	DOP	PTAM 2304	2	-	1		6	-	-	-	-	-
	Electric and dielectric properties of crystals													
5.	Optical Spectroscopy of advanced materials	DS	DOP	PTAM 2305	2	-	2		6	-	-	-	-	-
	Laser Crystals													
6.	Specialization practice (projects, etc)	DS	DO	PTAM 2401	-	-	-	-	-	-	-	-	8	14
7.	Scientific research internship	DS	DO	PTAM 2402	-	-	-	-	-	-	-	-	4	8
8.	Practice for elaboration of dissertation	DS	DO	PTAM 2403	-	-	-	-	-	-	-	-	4	8
Total					10	2	5	-	30	-	-	-	16	30
Total teaching hours per week					17				16					

Noncompulsory Disciplines														
Nr. crt.	Discipline	C1	C2	Discipline Code	Semester I				Semester II					
					Number of hours/ week				Number of credits	Number of hours/ week				Number of credits
					C	S	L	P		C	S	L	P	
1.	Volunteering activity 3	DC	DFAC		-	1	-	-	2	-	-	-	-	-
2.	Volunteering activity 4	DC	DFAC		-	-	-	-	-	-	1	-	-	2

Legend

C1	content criterion
C2	the obligation criterion
DF	fundamental disciplines
DD	field disciplines (where applicable)
DS	specialized disciplines
DC	complementary disciplines
DO	compulsory (imposed) disciplines
DOP	optional disciplines (of your choice)
DFAC	Noncompulsory disciplines
CP	professional competency
CT	transversal competence
C	course-type didactic activity
S	seminar-type didactic activity
L	didactic activity of practical laboratory type
P	didactic activity of the internship type

Discipline code: <faculty><department><no. discipline>

BILANȚ GENERAL I (după criteriul conținutului)

Nr. crt.	Tip disciplină	Număr total de ore								Prevedere standard specific ARACIS
		Anul I		Anul II		Întreg programul de studii		% din total		
		Curs	S/L/P	Curs	S/L/P	Curs	S/L/P		Total	
1.	Fundamentale	6	6	-	-	6	6	12	17.4	-
2.	De domeniu (dacă există)	-	-	-	-	-	-	-	-	-
3.	De specialitate	12	10	10	23	22	33	55	79.7	-
4.	Complementare	1	1	-	-	1	1	2	2,9	-
TOTAL		19	17	10	23	29	40	69	100	-

BILANȚ GENERAL II (după criteriul obligativității)

Nr. crt.	Tip disciplină	Număr total de ore								Prevedere standard specific ARACIS
		Anul I		Anul II		Întreg programul de studii		% din total		
		Curs	S/L/P	Curs	S/L/P	Curs	S/L/P		Total	
1.	Obligatorie	17	15	4	19	21	34	55	79.7	-
2.	Opțională	2	2	6	4	8	6	14	20.3	-
TOTAL		19	17	10	23	29	40	69	100	-
3.	Facultative	-	2	-	2	-	4	4	-	<i>Nu intră în calculul totalurilor</i>
Raport total ore de seminar/laborator/practică / ore de curs						1.34			<i>1<R<2</i>	

Responsabil program de studii,

Prof.dr. Daniel Vizman

Director de departament,

Conf.dr. Catalin Marin

Decan,

Conf.dr. Mihai Lungu

Rector,
prof. univ. dr. Marilen Gabriel PIRTEA

